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Ballistic missile proliferation continues to expand worldwide. In response to this threat, the Missile Defense Agency has fielded a ballistic missile defense (BMD) system to protect Americans from missile attacks. Nevertheless, conflicts concerning the particulars of BMD operational command and control persist. Some advocate that Strategic Command should be the global commander for BMD. On the other hand, regional combatant commanders could maintain a standing joint task force to tailor, integrate, and streamline BMD operations. An analysis of the operational factors of BMD in terms of time, space, and force will help substantiate this thesis and lead to recommendations for determining the optimal BMD command and control architecture under each regional combatant commander.

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Joint Warfare and the Modern Fire-Arrow: The Implications of Time, Space, and Force on Ballistic Missile Defense Command and Control

By

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

Signature: _____

16 May 2006

ABSTRACT

Ballistic missile proliferation continues to expand worldwide. In response to this threat, the Missile Defense Agency has fielded a ballistic missile defense (BMD) system to protect Americans from missile attacks. Nevertheless, conflicts concerning the particulars of BMD operational command and control persist. Some advocate that Strategic Command should be the global commander for BMD. On the other hand, regional combatant commanders could maintain a standing joint task force to tailor, integrate, and streamline BMD operations. An analysis of the operational factors of BMD in terms of time, space, and force will help substantiate this thesis and lead to recommendations for determining the optimal BMD command and control architecture under each regional combatant commander.

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And the rocket's red glare.[1]

Francis Scott Key, *The Star-Spangled Banner*

INTRODUCTION

The proliferation of ballistic missile technology that began in the last century continues to expand at alarming rates today. Although domestic and international intelligence communities disagree on the exact number and nature of various offensive missile systems, many experts believe that sixteen countries produce ballistic missiles and over thirty have systems in place (see table 1).[2] States acquiring ballistic missiles are increasing the range, reliability, and accuracy of their inventories.[3] Several of these countries, such as North Korea and Iran, have strained, if not near adversarial relationships, with the West. Furthermore, most analysts project that the United States (U.S.) will likely face intercontinental ballistic missile threats from North Korea and Iran within a decade.[4]

The Missile Defense Agency (MDA) has developed and fielded a ballistic missile defense (BMD) system consisting of integrated sensors, weapons, and command systems, in order to protect the U.S. from missile attacks by rogue states. Nevertheless, conflicts

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[1] Francis Scott Key, "The Star-Spangled Banner," *American Treasures of the Library of Congress* (Washington, D.C.: Library of Congress, 22 Nov. 2002); http://www.loc.gov/exhibits/treasures/trm065.html; accessed 4 May 2006.

[2] Andrew Feickert, *Missile Survey: Ballistic and Cruise Missiles of Foreign Countries* (Washington, D.C.: Library of Congress, Congressional Research Service (CRS), 5 Mar. 2004), 2-6, CRS RL30427.

[3] Central Intelligence Agency, *National Intelligence Estimate. Foreign Missile Developments and the Ballistic Missile Threat through 2015* (Washington, D.C.: National Intelligence Council, 2001); http://www.dni.gov/nic/special_missilethreat2001.html; accessed 17 Apr. 2006.

[4] Ibid. The CIA report conceded that one agency assessed the U.S. was unlikely to face the Korean and Iranian ICBM threat before 2015.

Table 1. Missiles by Category, Range, and Associated Countries

Range	Country
Intercontinental and/or Submarine-Launched Ballistic Missiles (ICBM) (>5,500 km)	China, France, Russia, United Kingdom, United States, North Korea (*Taep'o-dong* 2 or *Taep'o-dong* ICBM)
Intermediate-Range Ballistic Missiles (IRBM) (3,000 - 5,500 km)	India, Iran, possibly North Korea
Medium-Range Ballistic Missiles (MRBM) (1,000 - 3,000 km)	Israel, North Korea, Saudi Arabia, China, India, Pakistan, Iran
Short-Range Ballistic Missiles (SRBM) (70 - 1,000 km)	Afghanistan, Algeria, Argentina, Armenia, Belarus, Bulgaria, China, Czech Republic, Egypt, Greece, India, Iran, Iraq, Israel, Kazakhstan, Libya, Netherlands, North Korea, Pakistan, Romania, Russia, Serbia, Slovakia, South Korea, Syria, Taiwan, Turkey, Turkmenistan, Ukraine, United Arab Emirates, Vietnam, and Yemen.

Source: Andrew Feickert, *Missile Survey: Ballistic and Cruise Missiles of Foreign Countries* (Washington, D.C.: Library of Congress, CRS, 5 Mar. 2004), 6, CRS RL30427.

concerning the particulars of BMD operational command and control (C2) persist among the various combatant commanders and system developers. The commander of U.S. Strategic Command, General James Cartwright, stated in March 2006, "As you look at the [BMD] systems that we are fielding, the question is, how do we do global command and control . . . each combatant commander thinks he owns it."[5] As the MDA adds more capabilities to the

[5] Gopal Ratnam, "U.S. Grapples with Missile Defense Command, Control," *Navy Times*, 22 Mar. 2006; *http://www.navytimes.com/story.php?f=1-292925-1634100.php*; accessed 24 Mar. 2006.

existing BMD program, the importance of an effective operational C2 construct will only increase.

Some might advocate that Strategic Command (STRATCOM) should be the global combatant commander (COCOM) for BMD. Since STRATCOM is already responsible for military space operations and the Global Strike mission, BMD may be a natural fit into its existing organization. Given that ballistic missiles have the range to cross multiple areas of responsibility, a single chain-of-command could prevent the conflicts that might arise between regional COCOMs and ensure efficient use of limited BMD resources.

On the other hand, the regional COCOMs have the responsibility of conducting military operations in support of national objectives within designated geographic regions. Central Command (CENTCOM), European Command (EUCOM), and Pacific Command (PACOM) have unique geo-political environments and missile defense challenges that one overarching BMD C2 construct would not adequately address. Therefore, regional COCOMs should maintain a standing joint task force (SJTF) to tailor, integrate, and streamline BMD operations in support of theater strategic and operational objectives. Because of its unique capabilities and expertise in space and missile operations, STRATCOM should remain in a supporting role as the integrator across all regional COCOMs to eliminate seams and to set the conditions for effective BMD C2 through a global communications network.

To substantiate this thesis, an analysis of the operational factors of BMD will be conducted to determine the implications that time, space, and force have on C2 functions. This analysis will not only consider currently fielded BMD components but also the systems likely to become operational within this decade.

Current joint doctrine differentiates between theater and global missile defense. Theater missiles include ballistic, cruise, and air-to-surface missiles whose targets are within a given theater of operation.[6] A number of countries are attempting to develop or procure long-range ballistic missiles capable of striking America within the next ten years.[7] Within the context of this assessment, theater and global missile defense will be considered as one concept. Although the worldwide threat of cruise and air-to-surface missiles continues to grow, the scope of this analysis is limited to the study of ballistic missiles. Lastly, this assessment will focus primarily on the C2 of *active defense* operations, given that most of the recent and forthcoming innovations in missile defense are within this arena.[8]

BACKGROUND

"If only I had faith in you earlier" – Adolf Hitler to head of German Rocket Program.[9]
W. F. Craven and J. L. Cate, *The Army Air Forces in World War II*

Although considered by many to be the first modern use of such weapons, missile technology was not a new concept when Nazi Germany launched the V-2 against the Allies in World War II.[10] In fact, the Chinese launched hundreds of "fire-arrows" against Mongol

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[6] Joint Chiefs of Staff (JCS), *Doctrine for Joint Theater Missile Defense*, Joint Pub 3-01.5 (Washington, D.C.: 22 Feb. 1996), vii.

[7] Feickert, 2. See also note 4 and table 1.

[8] Author's emphasis. The four operational elements of theater missile defense are (1) passive defense, (2) attack operations, (3) active defense, and (4) command, control, communications, computers, and intelligence (C4I). Joint Pub 3-01.5, I-4.

[9] Walter Dornberger and Werner von Braun interviews by U.S. Army Air Force. *Intelligence Summary*, No. 45-13, 15 July 1946; quoted in W.F. Craven and J. L. Cate, eds., *Europe: Argument to V-E Day* vol. 3 of *The Army Air Forces in World War II* (Chicago: University of Chicago Press, 1948-1958, reprinted 1983); http://www.airforcehistory.hq.af.mil/Publications/fulltext/aaf_wwii-v3.pdf; accessed 1 May 2006; 88. The "V" in "V-2" stood for *Vergeltungswaffe*, which translated into English means "Vengeance Weapons."

[10] England was attacked with 1115 V-2s between Sept. 1944 and Mar. 1945. Craven and Cate, 544.

invaders at the battle of *Kai-fung-fu* in 1232 A.D.[11] Since World War II, a number of conflicts involved the prolific use of ballistic missiles: the Arab-Israeli War of October 1973, the Iran-Iraq War (1980-1988), Operation Desert Storm, and Operation Iraqi Freedom (OIF). The largest single loss of life among U.S. forces in Desert Storm resulted from an Iraqi Scud striking military barracks in Dhahran, killing twenty-eight service personnel. Saddam's forces fired shorter ranged ballistic missiles at U.S. and British forces during OIF. All of these missiles either were shot down or fell harmlessly in the desert or gulf waters.[12]

The MDA is leading efforts to field an integrated and layered BMD to defend against all types of ballistic missiles.[13] A family of sensor and weapon systems will provide a myriad of options for detecting and destroying ballistic missiles in flight. As of 2006, MDA had fielded the Ground Based Interceptors (GBI) and the Aegis Standard Missile-3 (SM3) to the West Coast and PACOM area of operations. The Patriot missile system, the most mature of the BMD systems, achieved significantly better results in OIF against short-ranged ballistic missiles than in Operation Desert Storm. Unfortunately, problems continued to persist with procedures and technology to prevent fratricide, which resulted in the loss of a British GR-4 Tornado and U.S. Navy FA-18 during the 2003 conflict.[14] Altogether, these

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[11] National Aeronautical and Space Administration, "A Brief History of Rocketry," *History of Manned Spaceflight.* 24 Aug. 2000; http://www-pao.ksc.nasa.gov/history/rocket-history.htm; accessed 29 Apr. 2006.

[12] Charles Anderson, "Air and Missile Defense: Operation Iraqi Freedom," *Army*, 54 (Jan. 2004): 43-46.

[13] The Department of Defense has spent $90 billion since 1985 and expects to spend an additional $58 billion over the next six years on BMD. Government Accountability Office (GAO), *Defense Acquisitions. Missile Defense Agency Fields Initial Capability but Falls Short of Original Goals,* (Washington, D.C.: Mar. 2006), 1.

[14] Conversely, an Air Force F-16 mistakenly identified and destroyed a Patriot battery thought to be an Iraqi air defense unit. Andrea Stone, "Patriot missile: Friend or Foe to Allied Troops," *USA Today,* (14 Apr. 2003); http://www.usatoday.com/news/world/iraq/2003-04-14-patriot-missile_x.htm; accessed 19 Apr. 2006.

three systems provide an intercept capability in the midcourse and terminal phases of ballistic missile flight.

The Department of Defense expects to field several new BMD components and systems over the course of the next decade. The Airborne Laser System (ABL), carried aboard a modified Boeing 747-400 airframe, will engage ballistic missiles in the boost phase. Another system currently under development, the Terminal High Altitude Area Defense (THAAD) System, will provide a rapidly deployed missile system that will shoot down ballistic missiles with "hit-to-kill" technology, providing regional and limited area terminal defense.[15] MDA is currently testing the ABL and expects to deploy the first THAAD unit in 2008-2009.[16]

MDA also developed the Command, Control, Battle Management, and Communications (C2BMC) system as the backbone of BMD.[17] C2BMC provides an integrated and layered network of all BMD components, giving commanders the ability to dynamically plan the missile defense structure, maintain real-time situational awareness and direct sensor and weapon systems during engagements.[18]

Joint military doctrine affords the joint force commander (JFC) the flexibility of organizing and assigning operational tasks to subordinate unified commands, functional

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[15] Missile Defense Agency (MDA), *A Day in the Life of Ballistic Missile Defense*, n.d.; http://www.mda.mil/mdalink/pdf/bmdsbook.pdf; accessed 19 Apr. 2006; under "THAAD."

[16] Lieutenant General Henry A. Obering III, "Statement: Missile Defense Program and Fiscal Year 2006 Budget," Congress, Senate, Defense Subcommittee of the Senate Appropriations Committee, *Hearing before the committee to review budget estimates of the FY 2006 Missile Defense Program*, 109th Cong, 1st sess., 11 May 2005; http://appropriations.senate.gov/hearmarkups/Director'sFY06WrittenTestimonySAC-D5-11-05FINAL.htm; accessed 11 May 2005; under "Building the Next Increment-Block 2006."

[17] In 2006, MDA expects to complete testing and verification of the C2BMC system in PACOM, NORTHCOM, STRATCOM, and the Cheyenne Mountain Operations Center (CMOC). GAO, 55.

[18] MDA, *Fact Sheet: Command, Control, Battle Management and Communications*, Sept. 2005; http://www.mda.mil/mdalink/pdf/c2bmc.pdf ; accessed 20 Apr. 2006; 1.

components, or joint task forces (JTF). Subordinate unified commands, such as U.S. Forces Japan, conduct operations on a long-term basis in either a functional or a geographic area. A JFC may also organize the force into functional components when multiple services operate in the same dimension or medium, such as the joint force air component commander (JFACC).[19] Finally, the Secretary of Defense, a COCOM, a subordinate unified commander, or an existing JTF commander may establish and assign forces to a JTF, such as JTF-Katrina or JTF-Southwest Asia, to achieve operational-level objectives.[20]

JFCs will normally assign the mission of defensive counterair operations to an area air defense commander (AADC), who is typically from the service with a preponderance of the air defense assets within the joint operations area (JOA).[21] Defensive counterair operations incorporate measures taken to counter an enemy's employment of aircraft and missiles – including cruise and ballistic missiles. The AADC establishes, with JFC approval, the joint force air defense plan for the JOA.

The JFC also assigns an airspace control authority (ACA), responsible for establishing procedures that promote joint force effectiveness through the safe, efficient, and flexible use of airspace with a minimum of restraints.[22] The ACA coordinates, integrates, and regulates airspace to increase operational effectiveness; but it does not have the authority to approve, disapprove, or deny combat operations.[23] Depending on the nature of the joint

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[19] JCS, *Joint Task Force Planning Guidance and Procedures*, Joint Pub 5-00.2 (Washington, D.C.: 13 Jan. 1999), III-3.

[20] JCS, *Doctrine for Joint Operations*, Joint Pub 3-0 (Washington, D.C.: 10 Sept. 2001), II-14.

[21] JCS, *Joint Doctrine for Countering Air and Missile Threats*, Joint Pub 3-01 (Washington, D.C.: 19 Oct. 1999), II-6.

[22] JCS, *Doctrine for Joint Airspace Control in a Combat Zone*, Joint Pub 3-52 (Washington, D.C.: 22 July 1995), I-2

[23] Joint Pub 3-52, I-2.

operations, the JFC could assign the AADC and ACA duties to separate commands, as a standalone AADC, or to a functional component commander such as the JFACC. In any case, the air defense plan and airspace control procedures must be closely coordinated and aligned to minimize the risk of fratricide.

How could a regional COCOM benefit from a SJTF-BMD? First and foremost it would provide the JFC with an executive agent responsible for planning, organizing, training, and employing assigned and attached BMD assets. Depending on the nature of a crisis, the JFC could designate the SJTF-BMD as the supported commander under the JFC, a subordinate unified commander, or another JTF for a specific operational task. Depending on the various factors of time, space, and force associated with an operation, the JFC could also assign the SJTF-BMD to a supporting role or integrated into a functional component commander's staff (such as JFACC, JFMCC, or JFLCC) as a Deputy, Regional, or Sector Air Defense Commander and/or ACA.[24] In any case, the SJTF would require resident expertise in C4ISR, space operations, Aegis, army air defense, and the ABL as well as the authority to liaison with STRATCOM for developing and implementing the BMD portions of the air defense plan.[25] Each regional SJTF-BMD would support the homeland defense mission by aligning and synchronizing the theater air and missile defense plans with NORTHCOM. The following chapter will review the effects of time, space, and force on BMD C2 to help

[24] Functional components could include, but not limited to, the Joint Force Air Component Commander (JFACC), Joint Force Maritime Component Commander (JFMCC), Joint Force Land Component Commander (JFLCC), and Joint Force Special Operations Commander (JFSOC). Joint Pub 5-00.2, figure III-1.

[25] The acronym C4ISR stands for Command, Control, Communication, Computers, Intelligence, Surveillance, and Reconnaissance.

outline the problem, validate the SJTF-BMD, and recommend solutions for the joint warfighter.

OPERATIONAL FACTORS OF BALLISTIC MISSILE DEFENSE

The Factor of Time

> The factor of time is the most critical and precious factor in the conduct of warfare.[26]
> Milan Vego, *Operational Warfare*

Regardless of the BMD C2 architecture, an enemy has the advantage since preparation times are shorter for ballistic missiles than defensive weapon systems. Liquid fuel rockets, like North Korea's *Taep'o-dong*-1/2, would require at least a day prior to launch for fueling operations, which might be detectable by surveillance assets.[27] Mobile transporter-erector-launchers (TELs) need minutes to hours in order to maneuver, setup, and launch, which makes them vulnerable to surveillance and interdiction for a much shorter duration than fixed launch sites. Mobile BMD systems, such as THAAD, Patriot, ABL, and Aegis, need time for positioning. Joint force planners can overcome this by anticipating the likely defensive requirements within an area of operations and forward-deploying BMD assets. In response to unforeseen crises, Patriot, THAAD, and ABL are capable of rapid deployment, but Aegis ships require comparatively longer transit times in order to reach

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[26] Milan N. Vego, *Operational Warfare*, (Unpublished Text, U.S. Naval War College, Newport, RI: 2000), 55.

[27] Center for Nonproliferation Studies, Monterrey Institute of International Studies (MIIS), *CNS Special Report on North Korean Ballistic Missile Capabilities* (Monterey, CA: MIIS, 22 Mar. 2006); http://cns.miis.edu/pubs/week/pdf /060321.pdf; accessed 1 May 2006; 4.

assigned stations. PACOM has forward deployed BMD capable Aegis ships and Patriot batteries to reduce the times associated with force deployment and transit. Pre-positioning of BMD assets, such as elements of the 32nd Army Air and Missile Defense Command, Patriot batteries, and Aegis platforms, prior to hostilities proved critical to the overall success of missile defense during OIF.[28]

Operational planners must also manage the time needed by BMD platforms to conduct other essential tasks, such as sustainment, maintenance, and training. In addition to replenishment at sea evolutions, ships have multi-warfare tasks that also compete for operational time. Army air defense units must move with the ground forces in order to provide adequate coverage of the battlefield during maneuver warfare. Time that might otherwise be lost in meeting these commitments can be mitigated by using multiple BMD platforms to ensure overlapping coverage while some units are unavailable.

In terms of the operational factor of time, regional COCOMs are apt to address the movement, sustainment, protection, and employment of BMD forces better than a single C2 structure under STRATCOM. Operational commanders have the detailed knowledge of the area and the forces available to more readily deal with the nuisances of the theater logistics system: ports and bases, lines of communication, host nation support, contractors, and coalition support. During OIF, CENTCOM's air, land and sea component commanders

[28] Colonel Robert Carney, Member of the National Security Decision Making faculty at the Naval War College. Former Operations Officer for the 32nd Army Air and Missile Defense Command, interview by author, 27 Apr. 2006.

successfully coordinated the mobilization, deployment, training, sustainment, and C2 for BMD components in eight different countries and several oceans.[29]

Whether it is a strategic attack against a foreign capital or a tactical engagement of ground forces, once initiated, the ballistic missile detect-to-engage sequence is a time-compressed event. High speeds and altitudes enable these missiles to penetrate enemy air defenses to strike a target as either a conventional weapon or a weapon of mass destruction (WMD) within a few minutes to half-an-hour.[30] In order to overcome the factor of time during a ballistic missile engagement, BMD assets should take action rapidly and decisively, with minimal overhead costs in terms of C2 time. The basis of joint C2 theory is the unity of effort through the decentralized execution of a centralized plan.[31] BMD assets can use this theory to overcome the factor of time by applying rules of engagement (ROE) and executing a thoroughly rehearsed pre-planned response.[32] During OIF, the Deputy AADC, Brigadier General Howard E. Bromberg, established and successfully implemented an air and missile defense plan that applied this concept of decentralized execution by utilizing a "playbook" to direct BMD forces in eight countries.[33] As the regional COCOM's executive agent for BMD, the SJTF would also develop and implement a comprehensive missile defense plan and maintain situational awareness of the battlespace through the C2BMC system. To reduce C2 delays, BMD forces could utilize the concept of "command by negation" by empowering lower echelons, such as a sector coordinator or tactical unit, to make decisions and execute

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[29] Anderson, 43.

[30] Since it can only destroy missiles within the boost phase, the ABL will likely have the shortest detect-to-engage sequence of all the BMD weapon systems.

[31] Joint Pub 5-00.2, II-1.

[32] Preplanned responses are akin to "IF-THEN" statements: IF the tracked object has certain kinematics and characteristics, THEN take the following steps . . .

[33] Anderson, 44; Carney.

tasks on their own initiative, as long as such actions are consistent with the commander's overall intent. All the same, as long as a commander applies unity of effort through decentralized execution of pre-planned responses and ROE, it is not discernable whether any C2 architecture is better at addressing the factor of compressed engagement timelines.

The Factor of Space

Although time is generally on the enemy's side, the operational factor of space can be an advantage or disadvantage for either belligerent. Ballistic missile speeds and ranges give the enemy the ability to optimally position launcher systems. The laws of physics, geographic access, the natural environment, politics, and diplomacy dictate the available locations for the defender's assets.

The enemy can use tunnels, underground facilities, terrain, vegetation, and weather to mask ballistic missile operations from surveillance and reconnaissance activities thus making intelligence arduous for any C2 construct. North Korea is slightly smaller than Mississippi (122,762 square kilometers), while Iran is a little larger than Alaska (approximately 1,648,200 square kilometers).[34] BMD operators must contend with these massive volumes of space in which a ballistic missile could originate. For example, the *No-dong* ballistic missile (maximum operational range of approximately 1,300 km) launched from anywhere in North Korea could strike not only the entire Korean peninsula, but also most of Japan, eastern China, and parts of southeastern Russia with a 1,100 kg payload. The Iranian variant of the

[34] Derived from multiple searches from the *Encyclopedia Britannica Online* at http://www.britannica.com/; s.v., "Korea" and "Iran."; accessed 1 May 2006.

same missile, the *Shahab*-3, is equally capable of striking most of the Middle East from its territory, including U.S. allies such as Israel and Turkey (see figures 1a and 1b).

Operational planners will utilize the C2BMC system to determine the most advantageous location for BMD assets to detect and engage ballistic missiles.[35] The ABL, for example, will most likely require an orbit within 300-600 km of anticipated ballistic missile launch points (depending on missile propulsion - solid or liquid fuel) to maximize the opportunity for an engagement in missile boost phase.[36] In the case of an ICBM launched at the continental U.S. from North Korea, the ABL may not be able to access airspace over China or Russia - airspace that is required for optimum ABL placement in this scenario. Aegis provides the BMD system with a robust detection capability, but maritime access limits the detection range in relation to the missile trajectory. During OIF, an Aegis destroyer, USS *Higgins*, was credited with the initial detection of SRBMs launched at coalition forces. On the other hand, Aegis may not detect missiles launched from far-inland regions. These ships would also need to be within a certain classified range of the projected missile flight in order to engage the ballistic missile with the SM-3 interceptor.

The environment and enemy actions may reduce the operating space for BMD assets. Cloud cover and weather could initially mask ascending ballistic missiles, further reducing the ABL's reaction time. Typhoons or even less severe storms may negate the use of Aegis.

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[35] In 2006, MDA expects to complete testing and verification of the C2BMC system in PACOM, NORTHCOM, STRATCOM, and the Cheyenne Mountain Operations Center (CMOC). GAO, 55.

[36] David K Barton *et al*., *Report of the American Physical Society Study Group on Boost-Phase Intercept Systems for National Missile Defense: Scientific and Technical Issues* (College Park, MD.: American Physical Society, 5 Oct. 2004, revised 13 Oct. 2004 and 16 Feb. 2005); http://www.aps.org/media /pressreleases/loader.cfm?url=/commonspot/security /getfile.cfm&PageID=57863; accessed 20 Apr. 2006; xxxv.

Figure 1a: Estimated Ranges of Iranian Ballistic Missiles

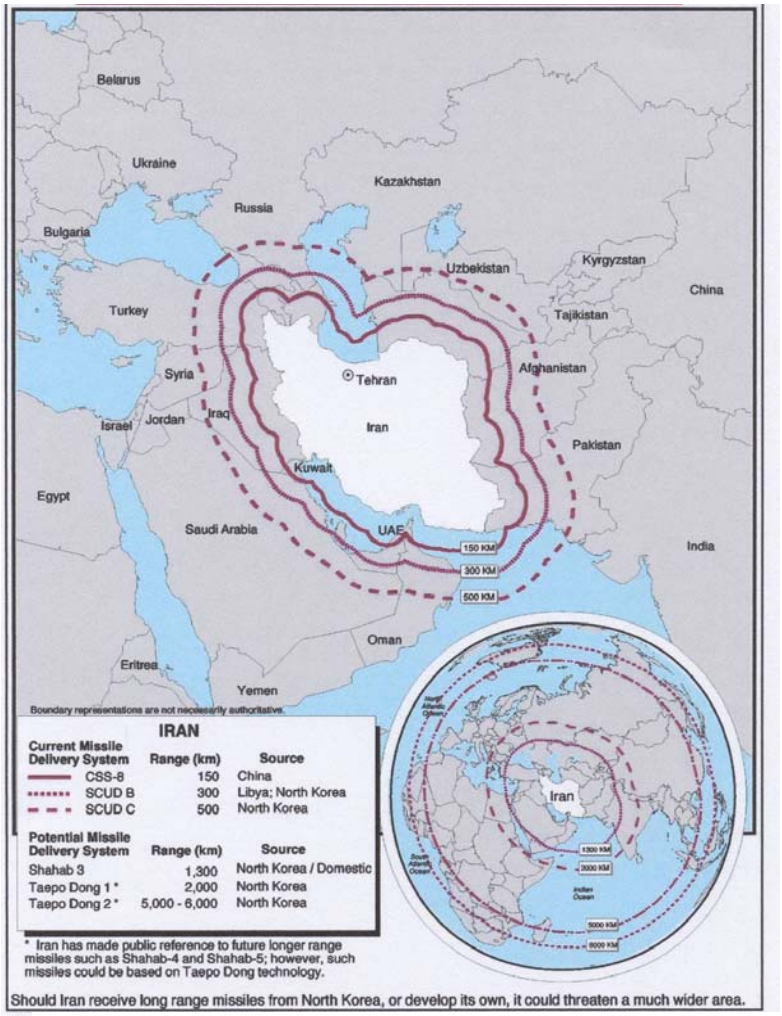
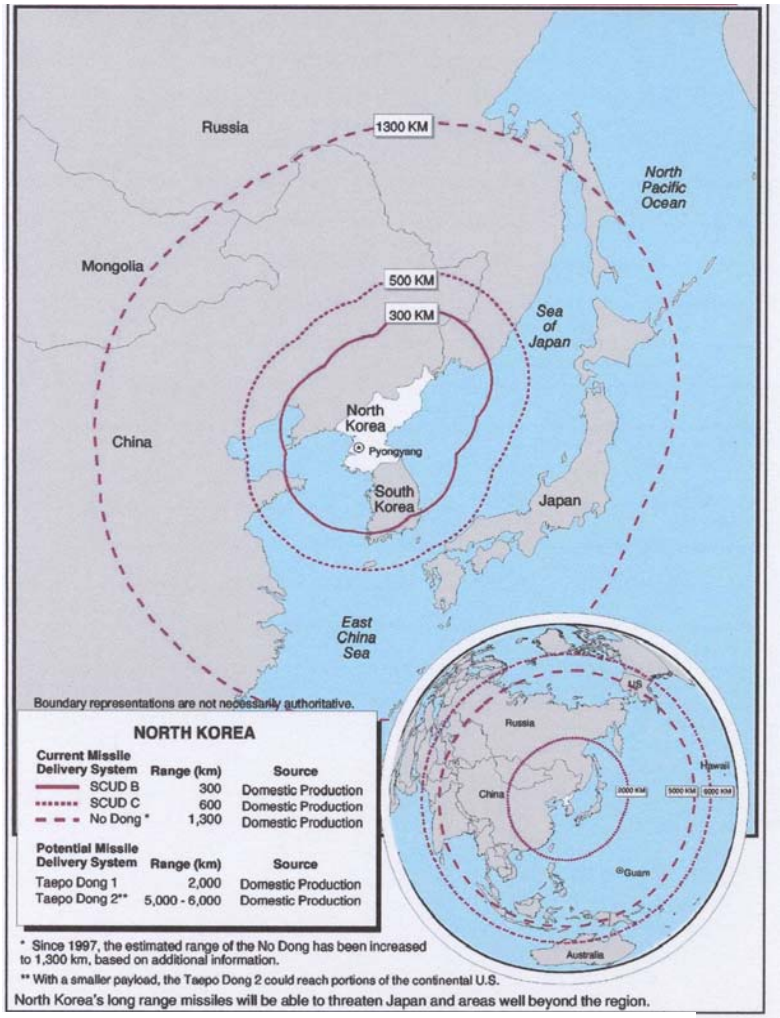


Figure 1b: Estimated Ranges of North Korean Ballistic Missiles



Source: Department of Defense, *Proliferation: Threat and Response* (Washington, D.C.: January 2001), pp 12, 37.

The enemy could also conduct access denial operations, such as mining the Strait of Hormuz or deploying anti-ship cruise missiles (ASCM), attack aircraft, surface combatants, or submarines within range of Aegis operating areas. Although operational commanders cannot control the weather, neither can a global COCOM. Furthermore, a SJTF or functional component commanders are in a better position than a global COCOM to address the enemy threat to BMD assets through force protection, operational fires, and combined arms.

An additional concern is the management of airspace to prevent mutual interference in joint and civilian air operations. To prevent fratricide or civilian casualties, operational planners must consider the potential laser line of sight and interceptor trajectories, airspace control and defense procedures, as well as system capabilities and limitations. Some weapon systems such as GBI, THAAD, and Aegis SM-3 are less intrusive to airspace control measures because the interceptor will only take seconds to reach the exoatmosphere using a near vertical trajectory and a high rate of speed. Point defense systems, particularly those protecting key assets such as airfields and ground troops, pose significantly more risk to friendly air assets than BMD weapon systems in remote terrain, open-ocean or high altitudes. In most scenarios, operational and tactical commanders are in a better position than anyone else in the world to assess and mitigate mutual airspace interference.

Scientific expertise and technological advancements coupled with an advanced industrial base provides the U.S. with freedom of action in space (referring to the exoatmosphere). Of all the joint commanders, only STRATCOM has the capability and mission to operate BMD assets stationed in space. Satellite constellations such as the Defense Support Program, Space-Based Infrared System, Space Tracking, and Surveillance System provide the BMD network with early warning of ballistic missile launch by detecting

the thermal signature of missiles in boost phase. Another consideration for BMD is the fact that midcourse intercepts will also occur in or near the exoatmosphere, with some - if not all - of the debris burning-up during atmospheric reentry.

Political factors and diplomacy may affect the operational employment of BMD more than science and technological advances. Robert Walpole, serving as the Central Intelligence Agency's National Intelligence Officer for Strategic and Nuclear Programs, testified before Congress that many countries seek such technology not for operational weapons of war, but as "strategic weapons of deterrence and coercive diplomacy."[37] Because of this political environment, the National Intelligence Estimate (NIE) in 2001 stated that the probability of a WMD being used against U.S. interests is higher today than ever.[38] This is alarming considering that ballistic missile capable countries, such as Iran, have declared policies that coerce and threaten their neighbors.[39]

Regional politics will require commanders to account for third party strategic interests in operational planning. The 32nd Army Air and Missile Defense Command's Operations Officer during OIF, Colonel Robert Carney, aptly stated, "One man's theater missile defense is another's national missile defense."[40] Out of concern for a repeat of Saddam's 1991 Scud attacks, Kuwait purchased the Patriot missile system after Desert Storm

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[37] Robert D. Walpole, "The Iranian Ballistic Missile and WMD Threat to the United States Through 2015," Statement for the Record to the International Security, Proliferation and Federal Services Subcommittee of the Senate Governmental Affairs Committee (as prepared for delivery). 106th Cong., 2nd sess., 21 Sept. 2000; http://www.odci.gov/cia/public_affairs/speeches/2000/walpole_missile_092200.htm; accessed 17 Apr. 2006; under "The Evolving Missile Threat in the Current Proliferation Environment."

[38] National Intelligence Estimate, under "Introduction."

[39] Iranian President, Mahmoud Ahmadinejad, declared that Israel must be "wiped out from the map. Shirzad Bozorghmehr, "Iranian Leader: Wipe out Israel," *CNN.com*, 27 October 2005; http://www.cnn.com /2005/WORLD/meast/10/26/ahmadinejad/index.html; accessed 19 April 2006.

[40] Carney.

and integrated it into coalition forces leading up to OIF. During the latter conflict, Kuwaiti Patriot batteries destroyed an Iraqi Ababil-100 SRBMs aimed at coalition forces.[41] Additional countries, such as Japan and Israel, are working closely with the MDA to develop and field BMD components or like-systems for their own national missile defense. Without doubt, these countries consider these assets and their cooperation with the U.S. to be essential elements of a strategic deterrence policy toward potential adversaries.

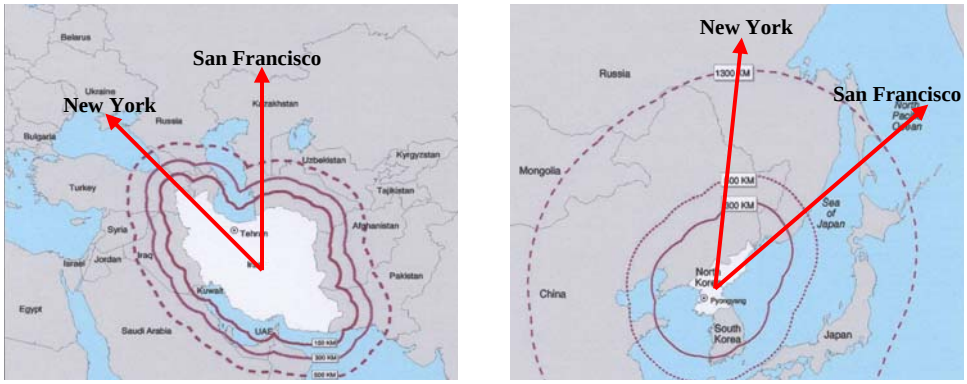
Ballistic missile and WMD arsenals can facilitate nationalistic pride and prestige, aspects that are subjective in nature and not easily defined when considering what military options an enemy might choose. On the other hand, the mere presence of BMD weapon systems, such as Patriot, can also provide comfort to U.S. and coalition forces as well as the host nation's populace. During OIF, Patriot coverage in Kuwait and Iraq not only boosted the confidence of coalition partners and Kuwaiti citizens, but also the confidence of the American and British troops that Saddam's forces targeted with SRBMs.[42]

Diplomacy and cooperation of third party countries may significantly impact BMD operations. Not all ballistic missile trajectories are benign to third parties. Korean ICBMs would travel over China and Russia in order to strike the U.S. west coast (see figure 2). As previously described, BMD assets such as ABL would most likely be unable to engage the ICBM unless they were orbiting over one of these countries. The same conditions apply to a scenario involving Iran, whose missiles would cross Russia and parts of Europe en route to North America. However, there are those skeptics of North Korea and Iran's ability to produce missiles with sufficient range to threaten the American continent. Nevertheless,

[41] Anderson, 44.
[42] Ibid.

North Korean missiles, whose trajectories would overfly Japanese territory, currently have the range to target U.S. bases in the Pacific. Similarly, Iranian missiles, which would overfly Iraq and Jordan, are also able to reach Israel. In any case, third party cooperation – or lack thereof – must be accounted for when developing operational plans and employing an effective BMD. Host nation or third party countries may not tolerate the remnants of destroyed ballistic missiles falling back to Earth inside their territory. The crash of several Tomahawk cruise missiles inside Turkey during OIF ended Turkish overflight permission for these weapons. This forced the operational commander to move some ships from the Mediterranean to the Northern Arabian Gulf in order to launch their cruise missiles. The same circumstance might arise in future conflicts using BMD, especially if the ballistic missile is carrying WMD. Joint force commanders should include the containment and cleanup - also known as consequence management - of any residual WMD material within BMD operational plans.[43]

Figure 2. Possible Iranian and North Korean ICBM Trajectories.



Source: Chart only, DOD, *Proliferation: Threat and Response*

[43] Consequence management: "Those measures taken to protect public health and safety, restore essential government services, and provide emergency relief to governments, businesses, and individuals affected by the consequences of a chemical, biological, nuclear, and/or high-yield explosive situation." JCS, *Dictionary of Military and Associated Terms*, Joint Publication 1-02 (Washington, D.C.: 12 Apr. 2001), 113.

To address these aspects of politics and diplomacy, theater commanders conduct activities to build regional relationships and cooperation on a continual basis. Regional COCOMs and their subordinate commands develop and implement theater engagement plans, which marry national strategic and theater objectives.[44] To achieve U.S. national interests, regional commanders have the responsibility of developing bilateral or multilateral cooperation with regional civilian and military leaders through military related activities, diplomacy, and political dialog. For example, in the months leading up to OIF, CENTCOM lead several delegations throughout the region to garner coalition support, including one to Kuwait where BMD was a significant host nation concern. The outcome of these bilateral talks resulted in the integration of Kuwaiti and U.S. Patriot forces for BMD.[45]

The Factor of Force

In the realm of WMD and ballistic missile systems, it is difficult for any commander to accurately assess the combat power and capabilities of potential enemies because such determinations are based on partial information. Countries like North Korea and Iran shroud their missile programs with extensive secrecy and deception. However, foreign sales, testing, and logistical operations offer exploitable opportunities for intelligence and insight into one's missile program. At all levels of C2, operational plans should account for a belligerent's ability to produce or procure and sustain ballistic missile systems. Modern ballistic missile technology provides the user with a relatively simple weapon that is less expensive than

[44] JCS, *Theater Engagement Planning*, CJCSM 3113.01A (Washington, D.C.: 31 May 2000), A-1.
[45] Carney.

strike aircraft. In 1999, for example, the North Korean government sold the *Hwasong* 5/6 (modified Scud B/C) for $1.5 – 2.0 million each and offered the *Taep'o-dong* I for $6.0 million.[46] In comparison, the Russian made Su-27/30/35 FLANKER series of multi-role attack aircraft sold for approximately $37 million a copy.[47] Mobile systems utilize passive measures, such as concealment, in addition to active defense for force protection. Larger missiles require static storage and launch facilities, which are often harder to conceal and more vulnerable to intelligence gathering activities and attack than mobile systems.[48] Nevertheless, planners should deploy sufficient forces to counter both the enemy's defenses and suspected ballistic missile arsenal.

Commanders must also assess the vulnerability of BMD assets to enemy interdiction – to include air, land, sea, space, and cyberspace – and plan accordingly for force protection requirements.[49] During OIF, air defense units maneuvering with ground forces utilized Bradley Linebackers and Avengers to provide enhanced self-protection from enemy interdiction efforts. Depending on several factors of time-space-force related to the operation – geography, overall mission, required forces, coalition and allies, etc. – operational and tactical commanders are better equipped to address issues related to force protection than a global COCOM.

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[46] Joseph Bermudez Jr., *A History of Ballistic Missile Development in the DPRK* (Monterey, CA: Center for Nonproliferation Studies, Monterey Institute of International Studies, 1999); http://cns.miis.edu /pubs/opapers/op2/op2.pdf ; accessed 19 April 2006; pp 19, 31.

[47] Global Security, *Chinese Aircraft*, 27 April 2005; http://.globalsecurity.org/military/world/china /j-11.htm; accessed 1 May 2006; under "SU-30 Purchases."

[48] Interdicting these aspects fall under the doctrinal realm of attack operations and is beyond the scope of this work.

[49] This could take the form of dedicated defensive counter-air (DCA) or naval surface action groups (SAG) to protect the ABL and Aegis ships.

Advanced scientific, technological, and industrial capability is a key advantage for the U.S. in terms of the factor of force. Efforts continue to improve interoperability not only among the joint forces, but also across a full assortment of U.S. allies and potential partners in BMD. U.S. dominance in space as well as C4ISR, doctrine, tactics, and training provides operational commanders with a robust capability to plan for, detect, and thwart an enemy ballistic missile attack. Sixty years of experience in space, missile, and information technology uniquely qualifies STRATCOM as the joint community's integrator and advocate for BMD.[50]

Although MDA has made significant strides in fielding BMD components, the number of interceptors remains small when compared to those of ballistic missiles. Referring to the GBI inventory, General Cartwright advocated the need for COCOMs to exercise discipline since the U.S. possessed "one magazine and four or five triggers."[51] On the other hand, MDA fielded GBIs to defeat a ICBM threat, which if launched from North Korea or Iran, would most likely take a trajectory that regional COCOM assets could not reach (see previous figure 2). Furthermore, the Alaskan based GBIs fall under NORTHCOM's operational control (one trigger) for homeland defense, in which all regional COCOMs are supporting commanders.

[50] STRATCOM established in 1946. U.S. Department of Defense, *U.S. Strategic Command History*; http://www.stratcom.mil/about-ch.html; accessed 10 May 2006.

[51] Ratnam.

SUMMARY AND CONCLUSION

In the final analysis, the sum of the operational factors of time, space, and force favor a BMD C2 under each regional COCOM (see table 2). STRATCOM's expertise gives the global COCOM advantages to serve as an integrator and facilitator of global BMD across geographic boundaries. This analysis suggests that the various factors of time-space-force present the regional commanders with several options for organizing BMD C2. As a general guide, commanders should consider (1) the geography - geometry of the JOA, (2) the scope of the operational objectives, (3) the makeup of coalition-joint forces, and (4) the tactical-operational-strategic nature of the battlefield to determine the appropriate theater BMD C2 (see figure 3). The geometry and geography of the potential ballistic missile battlespace along with the joint force footprint affects the scope of BMD C2. The more constricted a battlespace becomes – due in part to its geometry/geography or forces employed – the more likely the SJTF-BMD would be incorporated under a functional component commander. Such large-scale operations, such as OIF, tax airspace deconfliction efforts as well as the operational functions of force protection and maneuver, each of which increases BMD requirements. Conversely, as the scale tips towards the lesser extreme of these characteristics, such as a mission to defend Israel, the more likely a SJTF would fall under the JFC as a supported commander. Focused on a much narrower mission, such operations would involve fewer forces (means) to achieve the operational objective (ends). The operational commander must also evaluate the enemy's combat potential, to include the ballistic missile force, and its implications upon the operational objectives.

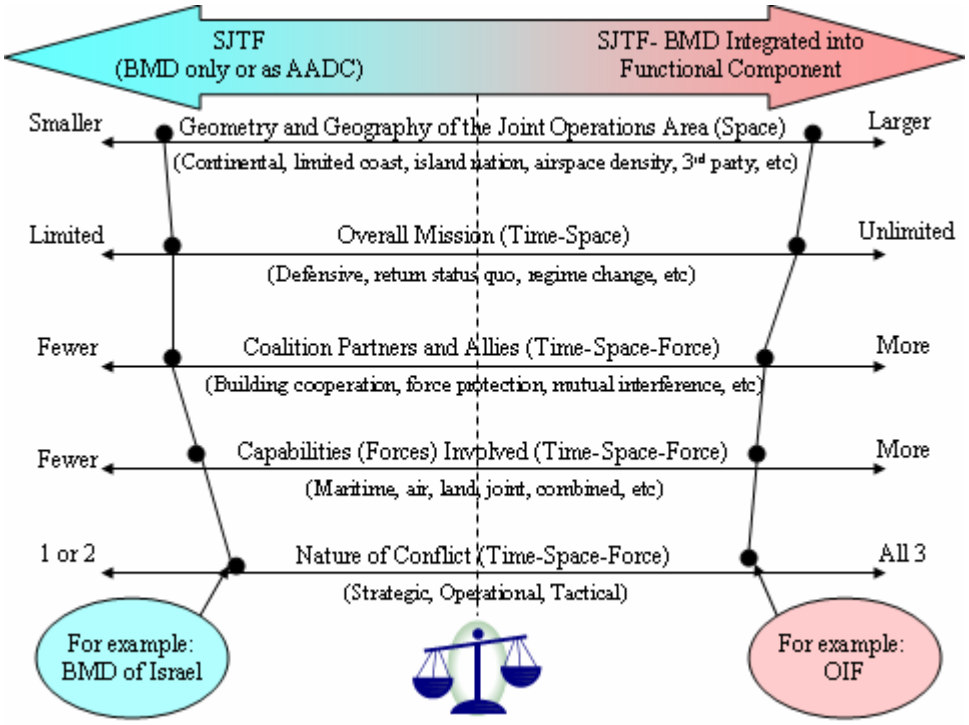
Table 2. Which C2 Could Better Address the Operational Factors of Time, Space, and Force?

Summary	Regional COCOM		Global COCOM
Operational Factor of Time	SJTF[1]	FCC[2]	
Relatively short ballistic missile pre-launch preparation time			
BMD asset mobilization, deployment, transit, etc			
Other tasks: warfare, maintenance, sustainment, training, etc			
Time-compressed detect-to-engage sequence			
Operational Factor of Space			
Concealment of ballistic missile operations			
Search volume and sensor/weapon placement			
Environmental factors (weather, natural features, etc)			
Force protection – to ensure maximum operating space			
Prevent interference in joint - civilian air operations			
U.S. freedom of action in space (exoatmosphere)			
Effects of regional politics			
Enemy political environment			
Confidence and relations with coalition partners and allies			
Diplomacy and cooperation of third parties			
Host Nation or third party consequence management			
Operational Factor of Force			
Enemy's ability to produce, procure, sustain			
Enemy ballistic missile system capabilities			
Enemy defensive capabilities			
Enemy interdiction capabilities			
U.S. scientific, technological, and industrial advantages			
U.S. dominance in space and C4I			
Doctrine, tactics, techniques, and procedures			
Limited Resource Management			
Legend			
No clear advantage OR equally capable			
More likely			

[1] SJTF as a standalone force conducting Ballistic Missile Defense, AADC, or both.

[2] Functional Component Commander (FCC): SJTF assigned to a FCC (JFACC, JFMCC, JFLCC, etc) as AADC, DAADC, or Regional/Sector ADC.

Figure 3. General Guide for Determining SJTF-BMD C2
Based on Time, Space, and Force



A SJTF-BMD would provide the regional COCOMs with an executive agent for BMD that could "plug and fight" with any operational C2 structure.[52]

Nevertheless, with the exception of the Patriot missile, the overall BMD system is still relatively immature, leaving many unanswered questions concerning the ultimate tactical, operational, and strategic implications on joint warfare in the twenty-first century. Some specific areas for further study:

1. Revising joint doctrine to reflect the emerging capabilities of global vice theater BMD.

[52] Carney. Quoted expression analogous to the computing term "plug-n-play."

2. Increasing the emphasis of consequence management planning in BMD doctrine.

3. Assessing the operational factors of cruise and submarine launched ballistic missiles and its effects on joint air and ballistic missile defense.

Although debatable, many consider ballistic missile warfare to be tactical warfare with potential national and theater strategic consequences. The key for successful BMD is a comprehensive and rehearsed air defense plan coupled with real-time situational awareness across the joint force both horizontally and vertically. Air defense plans, preplanned responses, ROE, and theater engagement are crucial elements of pre-hostilities planning. As the executive agent for BMD, each SJTF would liaison with NORTHCOM and STRATCOM to align, synchronize, and exercise each theater's air and missile defense plan to ensure seamless execution of the time-compressed detect-to engage battle. If one thing is certain with ballistic missile warfare, time does not favor the unprepared.

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